GSM Call Indicators

'Quiet-Calling' add-ons for mobile phones

By H. Steeman

Those small indicators that either flash or vibrate when there is a mobile phone call are well known by now. But how can they monitor the activity of a GSM phone remotely, and what is inside them? We've looked more closely at some of these gadgets.

These days GSM phones are part of everyday life. Within a period of five years, more mobile phones have been connected in most Western European countries than there are fixed connections. By contrast, it took about a 100 years for fixed phones to reach their current number. The introduction of the mobile phone has affected society greatly. More and more people are becoming irritated that they can be contacted on their mobile. There are numerous occasions when a mobile phone rings loudly when it is least wanted. Sitting peacefully on a terrace seems to have become more of a utopia nowadays.

Passive and yet active

GSM phones are compact transmitters/receivers (transceivers), just like other mobile phones and carphones. The transmitter in the handset uses a frequency of 900 or 1800 MHz and has a maximum power of 1 or 2 watts which allows it to make a connection to the GSM network. This RF power is sufficient to cover more than 20 miles, although the actually available distance will usually be much smaller. In-car mobile phones having an RF booster capable of putting out up to eight watts. Because the distance between the transmitter and receiver is usually much smaller than the maximum theoretical range, the transmission power is dynamically reduced to a level which is appropriate to the circumstances. This causes a reduction in RF power and is less of a drain on the battery.

Extending battery life

The transmitter takes its power from the battery in the phone. Obviously, the battery will be quickly drained at at a continous transmission power of 1 or 2 watts. Under these circumstances, a standby period of several days wouldn't be possible. That's why mobile phones are usually in a standby mode. The transmitter is then switched off, the control functions are idle (the backlights of the keypad and display are switched off), and only a low-power receiver searches for incoming control signals. These control signals use a fixed channel in the RF spectrum of the GSM network; a special time slot has been reserved for them. The control channel is used to send signalling information to and from the mobiles which are within range of the transmitter (BTS or Base Transceiver Station).

When to transmit

The network has to keep track of the location of the mobiles. Each mobile sends a message to the network at regular intervals, usually once every fifteen minutes, sometimes a bit longer. When a mobile is moving, for example during a car or train journey, it has to give a 'location update' each time it moves into a new cell. Again this causes the mobile to send a message to the GSM network. Whilst sending such a message a strong RF field is generated by the transmitter. Motorists will recognise when this happens by the crackling and buzzing sounds coming from the car radio. This signal can also cause interference in other audio equipment, which is in the vicinity of the mobile. The transmitter of a mobile is also active when confirming the reception of an SMS message, or sending one, and, of course, when making a call!

Transmitter LED

Keeping the previous theory in mind, it becomes clear how GSM indicators work. **Figure 1** shows an aerial that is sold for use as an indicator for several Nokia phones. The circuit consists of a small coil (similar to the spring found in ballpoint pens) which is used as the antenna. An LED and a diode are connected to a tap on the coil. During transmissions, a voltage is induced across the coil, which is sufficient to make the LED light up. The extra diode protects the LED against too high a voltage. So whenever the transmitter is on, the LED will light up.

Active detectors

Apart from passive indicators, which take their energy from the mobile, there are also active ones. **Figure 2** shows the circuit of a GSM indicator pen. Standalone vibration alarms also make use of a similar circuit. A small aerial picks up the RF signal and causes an LED to flash, or activates a vibrator (usually a small motor with an unbalanced weight attached to its spindle). A pair of button cells normally provides power to the circuit.

Active or passive, the indicators come on when the mobile sends control signals to the network, when registering with the network, when sending or receiving an SMS message, and during a call. With the transmitter off there will, of course, not be an RF field and the indicators will be idle. Of course, when using a call indicator, you will not forget to switch the GSM to 'quiet' (or 'meeting') mode, will you? Thank you!

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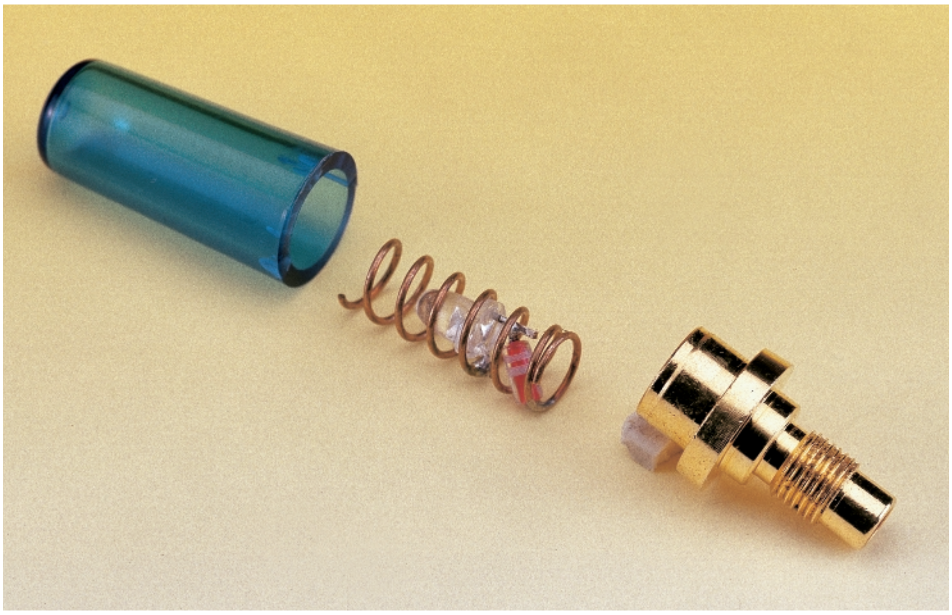

Figure 1. An indicator aerial is available for some Nokia handsets. An LED indicates when the transmitter is active.

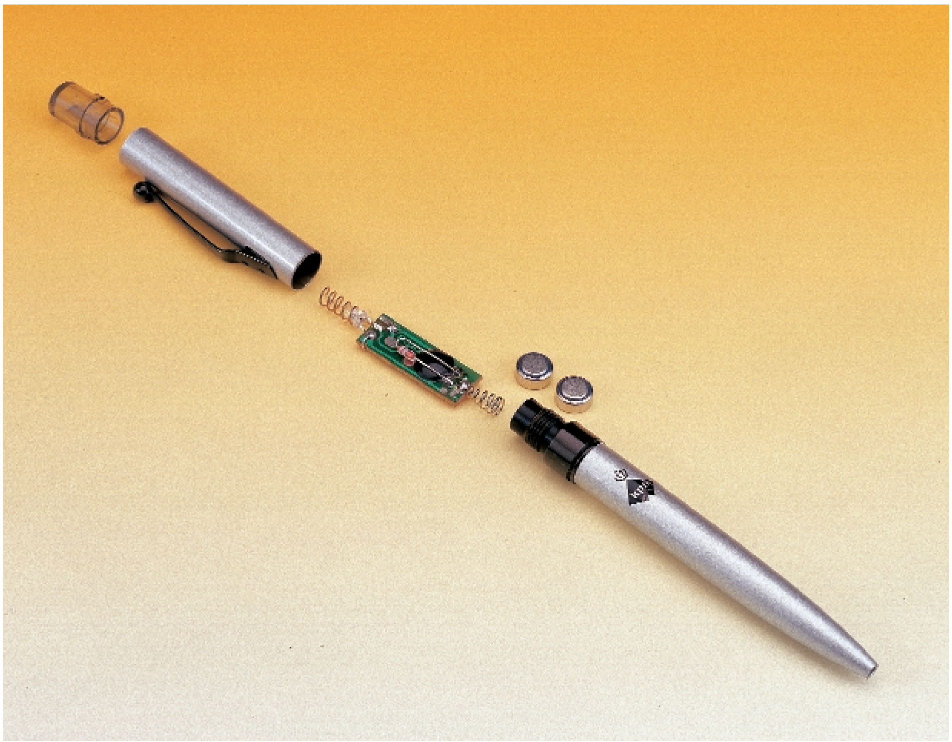

Figure 2. Pens with GSM indicators or standalone vibration alarms use an active detector.